

having its leaf-blades regularly attenuate-acute at the apex and conspicuously sharp-serrate with antrorse teeth on the margins, and the inflorescences very sparse at the tips of the branches.

The type of the variety was collected by Roy F. Steinbach (no. 191) in dry rocky soil at the foot of San Pedro hill, at an altitude of 2575 meters, Cercado, Cochabamba, Bolivia, on May 12, 1966, and is deposited in the herbarium of the Naturhistoriska Riksmuseum at Stockholm.

SERENOA REPENS f. GLAUCA Moldenke, f. nov.

Haec forma a forma typica speciei laminis foliorum distincte glaucis recedit.

This form differs from the typical form of the species in having its leaf-blades distinctly and more or less permanently glaucous.

The type of the form was collected by myself (no. 24161) in dry sandy woodland of pines at Lantana, Palm Beach County, Florida, on December 30, 1966, and is deposited in the herbarium of Aarhus Universitet at Aarhus, Denmark. This form is found chiefly along the eastern coast of Florida and in the scrub association, usually in purestand colonies, often adjacent to the normal form, which is also in separate distinct colonies.

ADDITIONAL NOTES ON THE GENUS AVICENNIA. II

Harold N. Moldenke

AVICENNIA L.

Additional bibliography: Dastur, Useful Pl. India 38. 1952; Asprey & Robbins, Ecol. Monog. 23: 375, 376, 378, 391, 403, & 411. 1953; Beard, Ecol. Monog. 23: 177. 1953; McLuckie & McKee, Austral. & N. Z. Bot., pr. 5, 88, 144, 459, 460, 658, 659, 662, & 700, fig. 31. 1962; D. B. Ward, Castanea 28: 174. 1963; H. D. Jordan, Journ. Appl. Ecol. 1: 209--212. 1964; Mani, Bull. Bot. Surv. India 7: 114. 1965; Hueck, Wald. Süd. 16 & 116. 1966; J. S. Beard, Descrip. Cat. W. Austr. Pl. 91. 1966; Moldenke, Phytologia 14: 301--320. 1967; Anon., Biol. Abstr. 48 (1): S.19 & S.205. 1967; H. D. Jordan, Biol. Abstr. 48: 383. 1967; Fichter, Frontiers 31 (3): 70--73. 1967.

Beard (1953) mentions that mangroves cover the littoral zone of tidal mud flats and sea lands in French Guiana.

AVICENNIA AFRICANA P. Beauv.

Additional bibliography: Moldenke, Phytologia 14: 306--309 & 312. 1967.

AVICENNIA GERMINANS (L.) L.

Additional bibliography: Asprey & Robbins, Ecol. Monog. 23:

375, 376, 378, 391, 403, & 411. 1953; D. B. Ward, *Castanea* 28: 174. 1963; H. D. Jordan, *Journ. Appl. Ecol.* 1: 209-212. 1964; H. D. Jordan, *Biol. Abstr.* 48: 383. 1967; Fichter, *Frontiers* 31 (3): 70-73. 1967; Moldenke, *Phytologia* 14: 305, 307, & 310-320. 1967; Anon., *Biol. Abstr.* 48 (1): S.19 & S.205. 1967.

Ward (1963) tells us that there are entire forests of this tree on Cedar and Seahorse Keys in Levy County, Florida. Fichter (1967) says that the Ten Thousand Islands region of western Florida has "the largest of all mangrove forests in the world." Asprey & Robbins (1953) record the species from Frunkenmans, Gun, Lime, and Southeast Cays, Jamaica, but maintain that it is not found on Morant Cays.

The Janishes describe the leaves as "always moist, dark green on front, gray green on back". Wiggins reports that the bark is light-gray. Hastings & Turner found the plant growing in association with Rhizophora mangle and Salicornia ambigua in Sonora, while Thomas reports Salicornia, Batis, and Maytenus phyllanthoides as common associates in Baja California. Wiggins found it growing on muddy strand and sandy flats, while Carter encountered it on low dunes. Additional vernacular names reported for it are "mangle pullequi" and "mangle senico" in Baja California.

The corolla is described as "white" on Janish & Janish 447 and I. L. Wiggins 16174, "yellow" on Breedlove 1577, "creamy-white with yellow center" on A. Carter 2721, and "pale-yellow, darkest in the throat" on R. Robertson 31. Wiggins states that the flowers are "very fragrant".

Additional citations: FLORIDA: Big Pine Key: Killip 40946 (Du--354040). Cedar Key: I. L. Wiggins 19342 (Du--564138). Key Largo: Janish & Janish 447 (Du--392607). Packet Key: I. L. Wiggins 20081 (Du--519170). Seahorse Key: Wiggins & Wiggins 19430 (Du--513126). MEXICO: Baja California: A. Carter 2721 (Du--344050); R. V. Moran 7151 (Du--440561); J. H. Thomas 7940 (Du--417492); I. L. Wiggins 11487 (Du--321784), 114563 (Du--437541), 16174 (Du--509697), 17526 (Du--512012); Wiggins & Wiggins 18017 (Du--507537), 18239 (Du--493595). Jalisco: J. Rzedowski 114605 (Du--513559). Oaxaca: F. H. Elmore D.21a (Du--347465). Sinaloa: Breedlove 1577 (Du--497341). Sonora: Hastings & Turner 64-35 (Du--507040); C. H. Lowe 3319 [R. M. Turner 60-40] (Du--560541). Carmen Isl.: R. V. Moran 3926 (Du--363299). San Francisco Isl.: I. L. Wiggins 17765 (Du--561128). San José Isl.: I. L. Wiggins 17672 (Du--512036). COSTA RICA: Guanacaste: F. H. Elmore E.1 (Du--347463). BAHAMA ISLANDS: Great Abaco: R. Robertson 31 (Du--382662). VENEZUELA: Falcón: Gines 4221 (W--2167639); Hueck s.n. [30-6-58] (N). BRITISH GUIANA: Archer 2625 (W--1663250); Irwin 270 (W--2172701), 542 (Au--165481, Au--178000, Mi). ECUADOR: El Oro: Hjerting & Rahn 643 (W--2314802). Esmeraldas: E. L. Little 6363 [U. S. Dept. Agr. Forest Serv. 29224] (W--1859876).

Guayas: Fagerlind & Wibom 114 (Mi); Harling 3075 (S), 4966 (S).
 GALAPAGOS ISLANDS: Charles: A. Stewart 3267 (Bi). Chatham: D. Snow 221 (Du—564535). Indefatigable: Rorin & Chris 205 (Bi);
Schimpff 30 (Gg—212443); A. Stewart 3270 (Bi); T. W. J. Taylor T.T.91 (Gg—461253), T.T.98 (Gg—461276); I. L. Wiggins 18310 (Rf), 18686 (Ac). Seymour: E. W. Elliott s.n. [1945] (W—1564050).
 PERU: Tumbes: López & Sagástegui 4007 (S). BRAZIL: Ceará: Drouet 442 (Lb—17193), 2442 (W—1594848), 2548 (Lb—17192). Maranhão: Fróes 1818 (Mi). Pará: Black 48-3237 (Ca—73003), 48-3427 (Ca—72920). Rio de Janeiro: Sampaio 8141 (Ja—44854, Ja, Ja, Ja), 8891 (Ja—44855, Ja). LOCALITY OF COLLECTION UNDETERMINED: Ashe s.n. [May 26, 1928] (Hi—59488).

AVICENNIA LANATA Ridl.

Additional bibliography: Moldenke, *Phytologia* 7: 206—209. 1960; Legris, *Trav. Sect. Scient. Inst. Franç. Pond.* 6: 547 & 556. 1963.

AVICENNIA LANCEOLATA (Engelh.) Moldenke

Additional bibliography: Moldenke, *Phytologia* 7: 209—210. 1960; Moldenke, *Biol. Abstr.* 35: 3688. 1960; Hocking, *Excerpt. Bot. A.5*: 46. 1962.

AVICENNIA MARINA (Forsk.) Vierh.

Additional synonymy: Avicennia sphaerocarpa "Stapf ex Ridley" apud Anon., *Kew Bull. Gen. Index* 1929-1956, 27. 1959. Avicennia officinalis Auct. ex Cuf., *Bull. Jard. Bot. Brux.* 32: Suppl. 803, in syn. 1962. Avicennia officinalis sensu Matsum. ex Liu, *Illustr. Nat. & Introd. Lign. Pl. Taiwan* 2: 1201, in syn. 1962. Avicennia nitida sensu Blanco ex Liu, *Illustr. Nat. & Introd. Lign. Pl. Taiwan* 2: 1201, in syn. 1962.

Additional & emended bibliography: F. Krauss, *Flora* 28: 68. 1845; W. Griff., *Trans. Linn. Soc. Lond.* 20: 1--7, pl. 1, fig. 8--12. 1846; A. Rich., *Tent. Fl. Abyss.* 2: 173. 1851; Aschers. in G. Schweinf., *Beitr. Fl. Aethiop.* 1: 118 & 278. 1867; Gürke in Engl., *Pfl. Ost-Afr. C*: 342. 1895; Matsum., *Bot. Mag. Tokyo* 13: 133. 1899; Matsum. & Hayata, *Journ. Coll. Sci. Univ. Tokyo* 22: 304. 1906; Talbot, *Forest Fl. Bombay* 2: 363 & 364, fig. 457. 1911; Gamble, *Fl. Madras* 1105 & 1106. 1924; Kudo, *Bot. Mag. Tokyo* 46: 154. 1932; Jovet, *Bull. Soc. Bot. France* 82: 219. 1935; Kanehira, *Form. Trees*, rev. ed., 641, fig. 598. 1936; Fletcher, *Kew Bull. Misc. Inf.* 1938: 443 & 444. 1938; Anon., *Kew Bull. Misc. Inf.* 1938: index 27. 1938; Lam & Meeuse in Holthuis & Lam, *Blumea* 5: 235. 1945; Razi, *Rec. Bot. Surv. India* 18: 6. 1959; Anon., *Kew Bull. Gen. Index* 1929-1956, 27. 1959; Moldenke, *Biol. Abstr.* 35: 3688 (1960) and 36: 719. 1961; Nair & Rehman, *Bull. Bot. Gard. Lucknow* 76: 22 & 23, pl. 2, fig. 12, & text fig. 26. 1962; Liu, *Illustr. Nat. & Introd. Lign. Pl. Taiwan* 2: 1201, pl. 1009. 1962; Hocking, *Excerpt. Bot. A.5*: 45 & 46. 1962; Cuf., *Bull. Jard. Bot. Brux.* 32:

Suppl. 803. 1962; McLuckie & McKee, Austral. & N. Z. Bot., pr. 5, 88, 144, 459, 460, 658, 659, 662, & 700, fig. 31. 1962; Moldenke, Dansk Bot. Arkiv 23: 85. 1963; Li, Woody Pl. Taiwan 15, 817--818, & 942, fig. 329. 1963; H. P. Riley, Fam. Flow. Pl. S. Afr. 128. 1963; Legris, Trav. Sect. Scient. Inst. Franç. Pond. 6: 323, 547, & 556. 1963; Backer & Bakh., Fl. Java 2: 614. 1965; Anon., Biol. Abstr. 47 (17): S.18. 1966; J. S. Beard, Descrip. Cat. W. Austr. Pl. 91. 1966; Macnae, Austral. Journ. Bot. 14: 67, 71, & 74--76. 1966; Moldenke, Phytologia 14: 309. 1967.

Additional & emended illustrations: W. Griff., Trans. Linn. Soc. Lond. 20: pl. 1, fig. 8--12. 1846; Talbot, Forest Fl. Bombay 2: fig. 457 [as A. alba]. 1911; Kanehira, Form. Trees, rev. ed., fig. 598. 1936; Nair & Rehman, Bull. Bot. Gard. Lucknow 76: pl. 2, fig. 12 & text fig. 26. 1962; Liu, Illustr. Nat. & Introd. Lign. Pl. Taiwan 2: pl. 1009. 1962; McLuckie & McKee, Austral. & N. Z. Bot., pr. 5, fig. 31. 1962; Li, Woody Pl. Taiwan fig. 329. 1963.

Recent collectors describe this plant as a shrub, 1 m. or less in height, or a tree, 10--15 m. tall, the bark white or blackish, and the corolla dark-yellow or orange-yellow. Nair & Rehman (1962) describe the pollen as 3--4-zonicolporate, subprolate, $40 \times 35 \mu$ with a range of $39--42 \times 32--37 \mu$, the colpi ends acute, tenuimarginate, the apocolpium diameter 10.5μ , the endocolpium lalongate, $3.5--14 \mu$, the exine 2.8μ thick, and the ectine slightly thicker than the endine, reticulate.

Talbot (1911), who misidentified this plant as A. alba Blume, describes it as follows: "A shrub usually gregarious; branches grooved, angular, finely white-tomentose. Leaves ovate-lanceolate, 2"--3" by .75"--1", acute at the apex and base; glabrous above, gray-tomentose beneath. Inflorescence as in the last species [A. officinalis]. Stamens included. Ovary and style villous. Capsule ovoid, flattened, .5"--.75" long, smooth, yellow when ripe. Closely allied to A. officinalis. India in tidal swamps, common throughout the Konkan; on the trap near the sea-shore at Bandra, Bombay. Fl. apparently throughout the year."

Backer & Bakhuizen van den Brink (1965) report that in Java this plant grows in the "mangrove (also in the more saline parts), banks of tidal streams", flowering all through the year. They describe it as "Flowers in 2--12-flowered heads, lowermost flower-pair sometimes distant from the other ones, but nevertheless the inflorescence not spiciform; adult heads $1/2--1 \frac{1}{5}$ cm long; style robust, c. $1 \frac{1}{2}$ mm long; stigmas recurved. Leaves elliptic-oblong or oblong-obovate, from an acute base, with an obtuse or rounded top, greenish-white beneath, 3--9 cm by $1 \frac{1}{4}--4 \frac{1}{2}$ cm."

It has been collected on mud flats above the tide line. The flowers were "dark-yellow" on Steward 3112, but "orange-yellow" on Smitinand 5641. The latter collection is described as having had "blackish bark", while on Smitinand 5642 the bark is said to have been "white". This collector calls the plant "common by the sea" in Thailand and reports the vernacular name "samae thale".

From Portuguese East Africa we have reports of the names "mocho", "mũçu", "musso", and "staca". Riley (1963) reports that this species, which he misidentifies as A. officinalis L., is called "white mangrove" and grows in Mozambique, Natal, and the eastern section of Cape Province to the Kentani Division."

In general, the distribution of A. marina may be said to extend from Egypt to Arabia, along the shores of the Red Sea and the western Indian Ocean to the Cape of Good Hope, eastward along the shores of the Arabian Sea, the Bay of Bengal, the northern and western Indian Ocean, the south China Sea north to Hongkong and Formosa, and the islands of the Philippine Sea, Coral Sea, and the South Pacific to New Zealand. Beard (1966) reports that in Western Australia it is called "white mangrove" and the flowers are scented.

Doty & Alvarez 14342 is described as having had a "heavy algal coating on trunks and finger-like knees, no prop roots" -- a photograph of the trees in situ is mounted on the sheet with the specimen. Pierre s.n. [Siam, 1868] was first identified as A. officinalis L. by someone, then later as A. marina var. intermedia (Griff.) Bakh. A note appended to F. A. Mendonca 1045 avers that it matches Burt 155, R. M. Graham 251, J. W. Gregory s.n., Hildebrandt 1241, Mearns 2145 & 2154, Schlieben 2547, and Volgens 160 in the herbarium of the British Museum. In Biol. Abstr. (1966) it is reported that a new species of fruitfly has been found infesting this plant.

McLuckie & McKee (1962) refer to the aerating roots or pneumatophores as "apo-geotropic", exposed to air at low tide. They note that soil air, in which the ordinary plant roots live, has a carbon dioxide content many times that of the atmosphere because of the respiration of roots and soil organisms and a slightly lower oxygen content. The pneumatophores have extensive aerenchyma in their cortex. They say that in the Sydney area the first colonizers of bare mud flats are Avicennia "officinalis" and the shrub Aegiceras majus; above this is the saltmarsh of Salicornia australis; above the tide level is the grass zone of Sporobolus virginicus, the rush zone of Juncus maritimus, and the sedge zone of Cladium junceum, then the saline swampy she-oak forest of Casuarina glauca, and then the freshwater swampy forest of Eucalyptus robusta.

Hochreutiner comments as follows: "Dans quelle mesure l'A. marina diffère-t-il spécifiquement de l'A. officinalis? L'examen de nombreux spécimens nous laisse dans le doute à ce sujet, un monographe seul pourrait décider. La forme des feuilles, invoquée par Vierhapper est non seulement variable suivant les individus, mais un grand nombre de spécimens sont hétérophylles. Le nombre des fleurs varie aussi et d'une manière indépendante de la forme des feuilles. Seule la disposition de ces fleurs en épis ± allongés ou en capitules et la dimension de la corolla qui varie de 3-15 mm. nous ont semblé avoir quelque constance, mais ce

sont là aussi caractères aléatoires. En revanche, le degré de villosité de l'ovaire et du style, invoqué par Bakhuizen nous a paru bien difficile à observer et laisse souvent planer de doute au sujet de l'identification. En réalité l'extrémité du style est toujours glabre. De sorte qu'il semblait plus judicieux de se contenter en l'occurrence d'une distinction variétale. Quant à la distinction variétale adoptée par Bakhuizen dans l'A. marina, nous l'avons appliquée d'après ses descriptions mais, on se rendra compte combien elle est précaire, en lisant sa clef analytique dont le première alternative invoque un caractère géographique et dépourvu de toute base morphologique. Nous serions tenté plutôt d'adopter le point de vue de Schimper (Bot. Mitt. aus den Tropen III, 98) qui rapporte tous les spécimens de l'Ancien monde à l'A. officinalis. Quelques distinctions variétales seraient pourtant probablement justifiées car nous avons noté expressément, sur place, que nos n. 1775 et 1776 étaient facilement reconnaissables et susceptibles d'être discernés l'un de l'autre. Nous avons rattaché les n. 1775 et 2866 à la var. intermedia et non à la var. Rumphiana à cause de leurs pétioles très courts car c'est là, en somme, la seule différence réelle que Bakhuizen reproduise sur ses planches."

The F. Krauss (1845) reference given in the bibliography above is often cited to Hochstetter, but the article in question is plainly credited to Krauss in the original!

Nair & Rehman (1962) cite a Nat. Bot. Gard. 44828, slide 3122, from India, while Li (1963) cites Mori & Morimoto s.n. from Formosa. The Yates 1110 distributed as A. marina is actually A. alba Blume, while Yates 2075 is A. officinalis L.

Additional citations: TANGANYIKA: H. G. Faulkner 1574 (B), 1591 (B); Tanner 2464 (B, S), 3414 (S). PORTUGUESE EAST AFRICA: Cabo Delgado: F. A. Mendonca 1045 (U1), 1076 (U1); Torre & Paiva 9616 (U1). Inhambane: Gomes e Sousa 2098 (U1). Lourenço Marques: Bal-sinhas 131 (U1), 232 (U1); Gomes e Sousa 155 (U1), 3793 (U1); Junod 517 (U1). Mozambique: Torre e Paiva 11484 (U1). SOUTH AFRICA: Natal: J. M. Wood 12973 (Bi). INDIA: Madras: E. K. Janaki 311 (Mi). CHINA: Fukien: A. N. Steward 3112 (Ca-44726). INDOCHINA: Cochinchina: Pierre s.n. [Hatien, 1/1874] (Ca-54861). THAILAND: Pierre s.n. [Siam, 1868] (Ca-54863); Smitinand 5641 [Herb. Roy. Forest Dept. 22952] (Gg), 5642 [Herb. Roy. Forest Dept. 22985] (Gg). WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Cebu: Doty & Alvarez 14342 (Ac).

AVICENNIA MARINA var. RESINIFERA (Forst.) Bakh.

Additional & emended bibliography: W. Griff., Trans. Linn. Soc. Lond. 20: 1-7, pl. 1, fig. 1-7, 13, & 14. 1846; F. M. Bailey, Compreh. Cat. Queensl. Pl. 387. 1913; Rechinger, Denkschr. Akad. Wiss. Wien 89: 589, fig. 29. 1914; R. T. Baker, Journ. & Proc. Roy. Soc. N. S. Wales 49: 257-281, pl. 35, 45, 46, & 48. 1916; Bakh.

in Bakh. & Lam, Nov. Guinea 14, Bot. 1: 172. 1924; J. M. Black, Fl. South Austr. 3: 483—484. 1926; Moldenke, Phytologia 7: 227—232 & 259—262. 1960; Moldenke, Biol. Abstr. 35: 3688 (1960) and 36: 719. 1961; Hocking, Excerpt. Bot. A. 5: 45. 1962.

Additional illustrations: W. Griff., Trans. Linn. Soc. Lond. 20: pl. 1, fig. 1—7, 13, & 14. 1846; Rechinger, Denkschr. Akad. Wiss. Wien 89: 589, fig. 29 [as A. officinalis]. 1914; R. T. Baker, Journ. & Proc. Roy. Soc. N. S. Wales 49: pl. 35, 45, 46, & 48. 1916.

Recent collectors describe this plant as a tree, 8 m. tall, or prostrate, with yellow flowers and light yellow-green fruit. It has been found growing on the banks of streams and in much-browsed "wallum" with Pimela, Leptospermum, Goodenia, Drosera, and Lobelia, at 2 meters altitude, flowering in December and fruiting in February. The flowers are described as "yellow" on MacDaniels 2504. E. H. Walker 5352 bears a notation "prostrate form".

Bailey (1913) misidentifies this taxon as A. officinalis L. and records the additional vernacular names "egaie", "e-pumer", and "kum-moo-roo". It is similarly misidentified by Rechinger (1914), Baker (1916), Black (1926), and Laing & Blackwell (1940). Black tells us that it is found "In mud close to the sea all around our coasts of Australia, but NOT Tasmania. Found in Asia, New Zealand, East Africa, and Polynesia. Rhizophora also present, sending DOWN roots; Avicennia sends UP aerial roots." Laing & Blackwell report that Avicennia has an embryo with 2 fleshy cotyledons unaccompanied by any trace of a rootlet. Therefore it has to germinate by adventitious roots only. They say, inaccurately, that "A. officinalis occurs also in Australia, throughout Melanesia and Malaysia to India and north to Mount Sinai on the Red Sea." They note that New Zealand has no Anopheles mosquitoes and so there is no malaria in its mangrove swamps as there is everywhere else in the world; also that this is the mangrove of the Auckland coast north of Kawhia on the west and of Opotiki on the east.

Rechinger (1914) notes "Mit auffallend schmalen Laubblättern.. Solomons-inseln: Insel Buka. Auf dem Strandriff mit Aegiceras corniculatum Blanco und Rhizophora-Arten." Baker (1916) discusses the morphology and wood anatomy and records the name "grey mangrove". His work is sometimes inaccurately cited as "1915".

Material of this variety has been misidentified and distributed in herbaria as A. officinalis L. On the other hand, the Kajewski 2344, in part, distributed as A. marina var. resinifera, is actually A. eucalyptifolia Zipp.

Additional citations: MELANESIA: NEW CALEDONIAN ISLANDS: New Caledonia: MacDaniels 2504 (Ca--54017); H. S. McKee 2114 (Go). AUSTRALIAN REGION: AUSTRALIA: Queensland: M. S. Clemens s.n. [23 September 1946] (Mi). South Australia: Kaspiew 38 (S), 539 (B). NEW ZEALAND: North Island: E. H. Walker 5352 (Ca--923408). Rangit-

toto Island: Meebold 5233 (Bi).

AVICENNIA MARINA var. RUMPHIANA (H. Hallier) Bakh.

Additional & emended bibliography: Lam & Meeuse in Holthuis & Lam, *Blumea* 5: 235. 1945; Moldenke, *Phytologia* 7: 262--266. 1960.

Lam & Meeuse (1945) record this plant from Karakalang Island in the Greater Sunda Islands.

Additional citations: WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Mindanao: Elmer 1045a (Bi), 12006 (Bi). MELANESIA: GREATER SUNDA ISLANDS: British North Borneo: Cuadra s.n. [Herb. North Borneo Forest. Dept. A.3187] (W--2129128).

AVICENNIA OFFICINALIS L.

Additional synonymy: Avicennia officinalis (L.) Kurtz ex Fletcher, *Kew Bull. Misc. Inf.* 1938: 443, in syn. 1938.

Additional & emended bibliography: A. Rich., *Tent. Fl. Abyss.* 2: 173. 1851; Aschers. in G. Schweinf., *Beitr. Fl. Aethiop.* 1: 118 & 278. 1867; Beddome, *Fl. Sylv. Anal. Gen.* 174, pl. 22. 1872; Brandis, *For. Fl. NW. & Cent. Ind.* 3: 371. 1874; Treub, *Ann. Jard. Bot. Buitenz.* 3: 79--88, pl. 14 & 15. 1883; Warb. in Engl., *Bot. Jahrb.* 13: 426--427. 1891; W. A. Talbot, *Syst. List Trees Shrubs Bomb.* 163 & 214. 1894; Gürke in Engl., *Pfl. Ost-Afr. C.* 342. 1895; Just, *Bot. Jahresber.* 23: 134, 155, & 506. 1897; J. Matsum., *Bot. Mag. Tokyo* 13: 133. 1899; C. B. Clarke in J. Schmidt, *Bot. Tidsskr.* 26: 175. 1904; Matsum. & Hayata, *Journ. Coll. Sci. Univ. Tokyo* 22: 304. 1906; E. D. Merr., *Philip. Journ. Sci. Bot.* 1, Suppl. 1: 122. 1906; Kawakami, *List Pl. Formos.* 83. 1910; A. Stewart, *Proc. Calif. Acad. Sci.*, ser. 4, 1: 131--132. 1911; Guillaumin, *Ann. Mus. Colon. Marseille* 9: 66 & 208. 1911; Despeissis, *W. Austr. Dept. Agr. Bull.* 13, ed. 1, 94--95. 1911; W. A. Talbot, *Forest Fl. Bombay* 2: 361--364, fig. 456. 1911; Dunn & Tutcher, *Kew Bull. Misc. Inf. Addit. Ser.* 10: 205. 1912; J. Matsum., *Ind. Pl. Jap.* 2: 528. 1912; F. M. Bailey, *Compreh. Cat. Queensl. Pl.* 387. 1913; Liebau, *Beitr. Anat. & Morphol. Mangrove* 2. 1913; R. T. Baker, *Journ. & Proc. Roy. Soc. N. S. Wales* 49: 257--281, pl. 35, 45, 46, & 48. 1916; Bose, *Man. Ind. Bot.* 253, fig. 220. 1920; H. N. Ridl., *Journ. Fed. Malay States Mus.* 10: 151 & 152. 1920; Despeissis, *West & Trop. North*, ed. 3. 1921; Gamble, *Fl. Presid. Madras* 1105 & 1106. 1924; H. J. Lam in Engl., *Bot. Jahrb.* 59: 29. 1924; J. M. Black, *Fl. South. Austr.* 3: 483--484. 1926; S. Sasaki, *List Pl. Formos.* 349. 1928; Schnarf in Linsb., *Handb. Pflanzenanat.* 10 (2): 233 & 380. 1929; Schencke, *Zytol. Untersuch. Verbenac.* 7 & 31. 1931; Kudo, *Bot. Mag. Tokyo* 46: 154. 1932; Paternmann, *Beitr. Zytol. Verbenac.* 46, 48, & 49. 1935; Jovet, *Bull. Soc. Bot. France* 82: 219. 1935; Fletcher, *Kew Bull. Misc. Inf.* 1938: 443 & 444. 1938; Anon., *Kew Bull. Misc. Inf.* 1938: index 27. 1938; W. A. Talbot, *Trees & Shrubs*, ed. 3, 408. 1949; Dastur, *Useful Pl. India* 38. 1952; Anon., *Kew. Bull. Gen. Index 1929-1956*, 27. 1959; Moldenke, *Phytologia* 7: 267--280 & 293. 1960; Santapau, *Fl. Bombay & Salsette* [3]. 1960; Swamy & Padmanabhan, *Curr. Sci. India* 30: 424--425.

1961; E. L. Little, *Phytologia* 8: 50--52 & 54--56. 1961; Khan, *Pakist. Journ. Forest.* 11: 43--45. 1961; Cuf., *Bull. Jard. Bot. Brux.* 32: suppl. 803. 1962; Anon., *Biol. Abstr.* 38: 1203. 1962; Nair & Rehman, *Bull. Bot. Gard. Lucknow* 76: 22. 1962; Liu, *Illustr. Nat. & Introd. Lign. Pl. Taiwan* 2: 1201. 1962; McLuckie & McKee, *Austral. & N. Z. Bot.*, pr. 5, 662 & 700. 1962; Padmanabhan, *Journ. Madras Univ.* 32B: 13--19. 1962; Meher-Homji, *Trav. Sect. Scient. Inst. Franç. Pond.* 7: 164 & 166. 1963; H. P. Riley, *Fam. Flow. Pl. S. Afr.* 128. 1963; Li, *Woody Pl. Taiwan* 818. 1963; Malaviya, *Proc. Indian Acad. Sci.*, ser. B, 58: 45--50 & 351, fig. 1--20. 1963; Legris, *Trav. Sect. Scient. Inst. Franç. Pond.* 6: 322, 323, 547, & 556. 1963; H. & E. Boyko, *Trans. N. Y. Acad. Sci.*, ser. 2, 26: 1091. 1964; Malaviya, *Biol. Abstr.* 45: 5670 (1964) and 45 (16): B.13. 1964; Van Steenis, *Fl. Males. Bull.* 19: 1113. 1964; D. E. Ferguson, *Biol. Abstr.* 45: 4257 & B.13. 1964; B. Singh, *Bull. Nat. Bot. Gard. Lucknow* 89: 14. 1964; Backer & Bakh., *Fl. Java* 2: 613. 1965; Moldenke, *Résumé Suppl.* 12: 9. 1965; Mani, *Bull. Bot. Surv. India* 7: 114. 1965.

Additional & emended illustrations: W. A. Talbot, *Forest Fl. Bombay* 2: fig. 456. 1911; Bose, *Man. Ind. Bot.* fig. 220. 1920; Khan, *Pakist. Journ. Forest.* 11: 43--45. 1961; Malaviya, *Proc. Indian Acad. Sci.*, ser. B, 58: 45--50, fig. 1--20. 1963.

Talbot (1949) describes the wood of this species as gray, the heartwood darker, hard, heavy, brittle, composed of well-marked concentric layers which consist of a ring of white tissue sometimes anastomosing with the ring of the next layer; the ring is lined with a row of moderate-sized pores, often containing a black substance; fine pores surrounded with white tissue are equally distributed throughout the layer; medullary rays fine, white, uniform; weight 66 pounds to the cubic foot; bark contains tannin; "used in India only for firewood". He records it as growing in "mangrove swamps of the Deccan peninsula and Ceylon, common in salt marshes and along the banks of tidal rivers and creeks, throughout the Konkan and North Kánara, flowering from March to May, the fruit ripe in July and August." In his 1911 work he erroneously places A. tomentosa Jacq. in the synonymy of this taxon.

Malaviya (1963) reports that the thick-walled lignified pitted cells found in the stem and leaf of this plant may be placed in the category of brachysclereids or "stone cells" of Tscherrich and Foster. These are actually transformed parenchyma cells in the stem, a hypodermal or mesophyll cell in the petiole and lamina of the leaf. They are formed by secondary sclerosis of these parenchyma cells. Baker (1916) also discusses the wood anatomy as well as the morphology, but his plant was probably A. marina var. resinifera (Forst.) Bakh. Nair & Rehman (1962) give the size of the pollen grains as 35 x 32 μ .

Patermann (1935) says: "Treub (1882) über Avicennia officinalis, dass die Verbenaceen in der Endospermwicklung wesentliche Unterschiede zeigen die ohne Zweifel für die verschiedenen Unterfamilien charakteristisch sind.... Immerhin dürften wir in der

Endospermwicklung von A. officinalis den spezialisiertesten Typus finden und dadurch auch zytologische die Anordnung dieser Unterfamilien (Avicennioideae) als zu Recht bestehend bestätigen."

Dastur (1952) tells us that in India and Pakistan the astringent bark of this tree is used for tannin, the wood ashes for washing clothes, the green fruit as a poultice in the treatment of boils, and the ripe fruit as food; painters mix the ashes with their color pigments to make them adhere better; the wood is used to make cheap beams and door-frames, but chiefly as fuel.

Mani (1965) describes a subglobose, agglomerate, solid, fleshy, verrucose pouch-gall made by an Eriophyes sp., 2--4 mm. large, the outer surface densely clothed with hair-like parenchyma emergences — his gall no. 507.

Additional vernacular names recorded for this plant are "hái-ka-tang", "hái-ka-tín", "hirugi-damashi", "hirugi-damasi", "hirugi-modoki", "ipati", "kari", and "white mangrove tree".

The "A. officinalis Auct." often referred to in literature is a synonym of A. marina (Forsk.) Vierh. Lam's note in Engler's Bot. Jahrb. (1924) is often erroneously cited as "1925", which is the title-page date for the completed volume. Boyke (1964) records this species as cultivated in Egypt, but I strongly suspect that he is referring to A. marina. The "A. officinalis L." of F. M. Bailey (1913) and the vernacular names which he records from Queensland doubtless belong under A. marina var. resinifera (Forst.) Bakh., as do also the Solomon Islands material and illustration cited by Rechinger (1914). Guillaumin (1911) cites Pennel 81 and Heun 279, but doubtless these represent misidentifications. Lam (1925) cites Volkens 193 from Yap, but this collection actually is A. alba Blume.

The G. F. Gaumer 635 [Herb. Umbach 15479], Schimpff 30, Snodgrass & Heller 605, and A. Stewart 3266, 3267, 3268, 3269, 3270, 3271, 3272, 3273, & 3274, distributed as A. officinalis, are actually A. germinans (L.) L.; E. K. Janaki 311, F. A. Mendonca 1045, Pierre s.n. [Siam, 1868], and J. M. Wood 12973 are A. marina (Forsk.) Vierh.; H. S. McKee 2114 and Meebold 5233 are A. marina var. resinifera (Forst.) Bakh.; and Elmer 1045a & 12006 are A. marina var. rumphiana (H. Hallier) Bakh.

Additional citations: INDIA: Bombay: H. St. John 24066 (Bi). MALAYA: Singapore: M. R. Henderson 34770 (S). WESTERN PACIFIC ISLANDS: PHILIPPINE ISLANDS: Luzon: Elgincolin s.n. [Herb. Philip. Forest. Bur. 28064] (Bi). Palawan: Kondo & Edaño 9242 [Philip. Nat. Herb. 36601] (Bi). INDONESIA: GREATER SUNDA ISLANDS: Sumatra: Yates 2075 (Mi). MELANESIA: NEW GUINEA: Papua: A. Hart s.n. [Herb. New Guinea Forest. Dept. 4530] (Bi).

AVICENNIA SCHAUERIANA Stapf & Leechman

Additional synonymy: Avicennia tomentosa sensu Mayc. apud Gooding, Loveless, & Proctor, Fl. Barbados 365, in syn. 1965.

Additional bibliography: Moldenke, *Phytologia* 7: 280—290. 1960; Angely, *Fl. Paran.* 16: 38 (1960) and 17: 15. 1961; Reitz, *Sellowia* 13: 29, 44—46, & 109. 1961; Angely, *Bibl. Veg. Paran.* 195. 1964; Moldenke, *Résumé Suppl.* 12: 3. 1965; Gooding, Loveless, & Proctor, *Fl. Barbados* 365—366 & 465. 1965.

Additional illustrations: Reitz, *Sellowia* 13: 45 & 46. 1961.

Reitz (1961) calls the association in which this species grows the "avicenieto". The Hahn 654, cited below, is a mixture with *A. germinans* (L.) L.

Additional citations: WINDWARD ISLANDS: Martinique: Hahn 654, in part (Ca—332488). TRINIDAD: Cowan & Forster 1252 (N). BRAZIL: Ceará: Drouet 2548 (W—1594887). Guanabara: A. Castellanos 23460 [Herb. Cent. Pesq. Florest. 1720] (Ac); Scheiman 108 (Ja—114108); J. Vidal s.n. [30/5/1934] (Ja—36839), s.n. [21 de Junho de 1934] (Ja—36838, Ja). Rio de Janeiro: Abreu s.n. [VIII/1925] (Ja—31572); Dusén 1963 (Ja—44852); Glaziou 1362 (Ja—11185); Schwacke 3111 [Herb. Saldanha 5962] (Ja—44866, Ja, Ja), s.n. [Maná, 16/I/1887] (Ja—44865); Ule 3884 (Ja—37434). Santa Catarina: Reitz 5088 (N); Reitz & Klein 683 (W—2281838), 1183 (Ca—46892). Falhas Island: Magalhães Corrêa s.n. [Oct. 1936] (Ja—30128). Governador Island: Rente & Rente s.n. [18.II.1958] (Ac, Ja, Ja, Ja). Paquetá Island: Descartes 7 (Ja—36350). Saravata Island: J. Vidal s.n. [Junho 1934] (Ja—31546, Ja, Ja).

AVICENNIA TONDUZII Moldenke

Additional bibliography: Moldenke, *Phytologia* 7: 290—292. 1960; Moldenke, *Biol. Abstr.* 36: 719. 1961.

Additional citations: COSTA RICA: Puntarenas: Tonduz 6776 (Mi—isotype).

ADDITIONAL NOTES ON THE GENUS PRIVA. IV

Harold N. Moldenke

PRIVA Adans.

Additional synonymy: Tertula "Roxb. ex Willd." apud Brenan, *Mem. N. Y. Bot. Gard.* 9: 37, sphalm. 1954.

Additional & emended bibliography: A. L. Juss., *Ann. Mus. Nat. Hist. Nat. Paris* 7: 69—72. 1806; Mirbel, *Ann. Mus. Nat. Hist. Nat. Paris* 15: pl. 14, fig. 2. 1810; Hook., *Bot. Misc.* 1: 159, 172, & 173. 1829; Peterm., *Cod. Bot. Linn. Ind. Alph.* 196. 1840; Endl., *Cat. Hort. Acad. Vindob.* 2: 47. 1843; F. Krauss, *Flora* 28: 68. 1845; Walp., *Repert.* 6: 687. 1847; D. Clos, *Ann. Sci. Nat.*, ser. 3, 10: 378—381. 1848; Bocq., *Adansonia* 2: 87—89, 94—99, 101, 109, 116, 123, 125, 130, 136, 139, 140, 143, 146—149, 152, & 154 (1862)